An Inland Port Monitoring System using Aerial and Ground Imagery





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Motivation

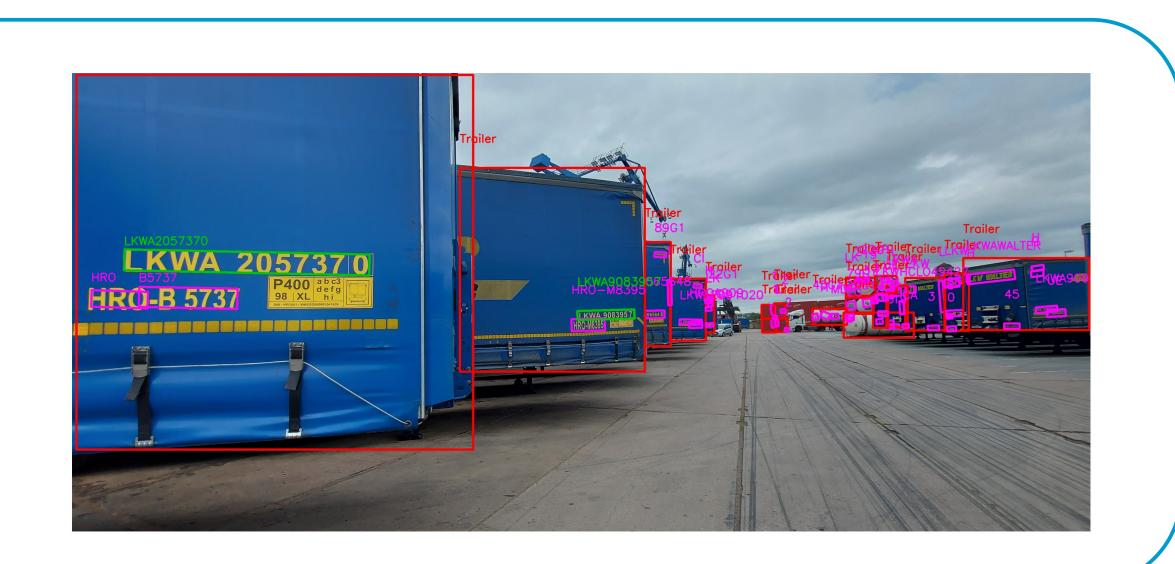
Task: Identify transportation units (TUs) such as containers and trailers by recognising their ISO6436 or EN13044 compliant ID code

Problem:

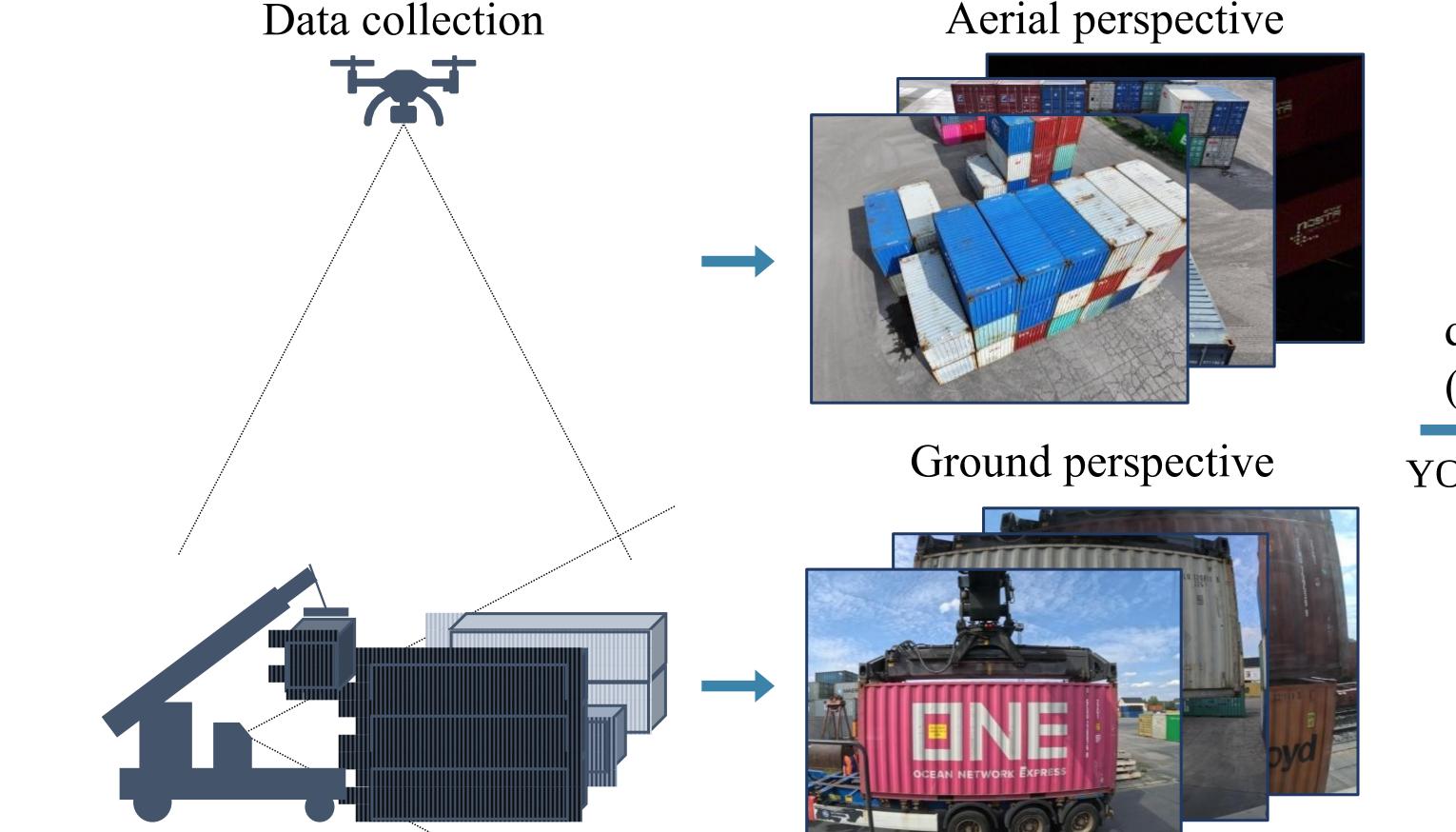
- Multi-purpose terminals in inland ports handle a variety of TUs in a limited area
- Storage configurations and operational processes are constantly changing
- Fixed infrastructure is not feasible for this dynamic environment

Idea:

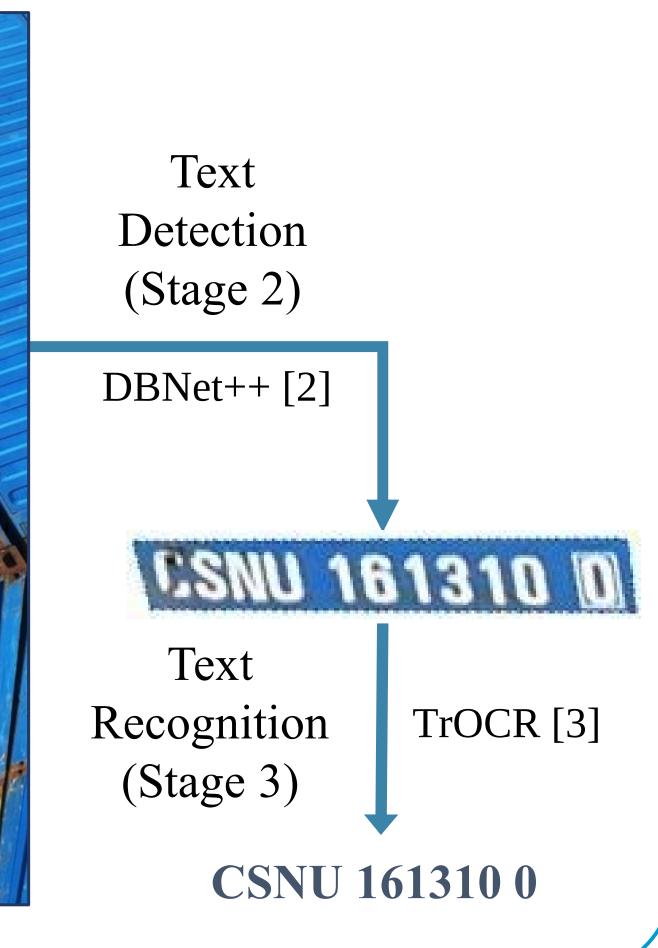
- Collect data from UAVs and sensor-equipped ground vehicles like reach stackers and trucks
- Detect TUs as a prior stage for text detection and text recognition to improve text detection



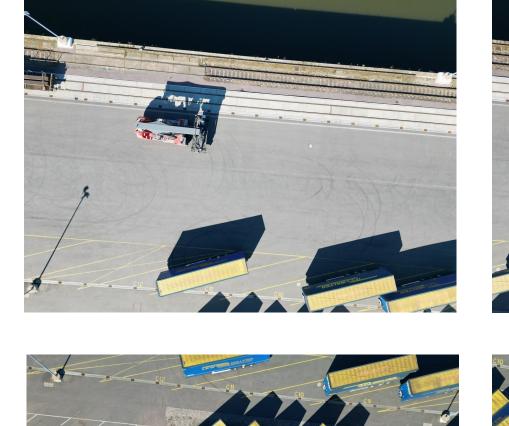
TU Identification System



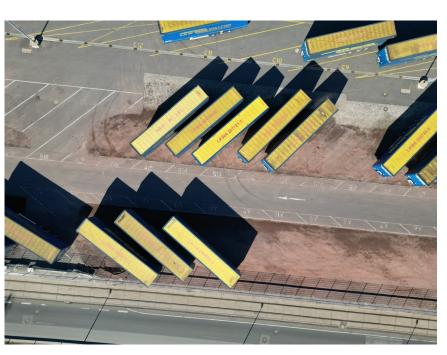


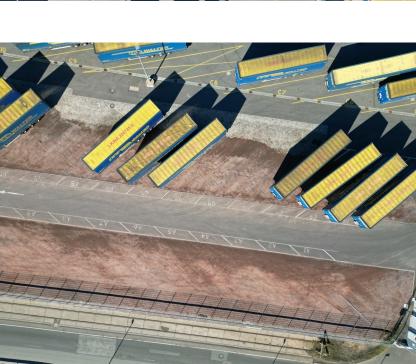


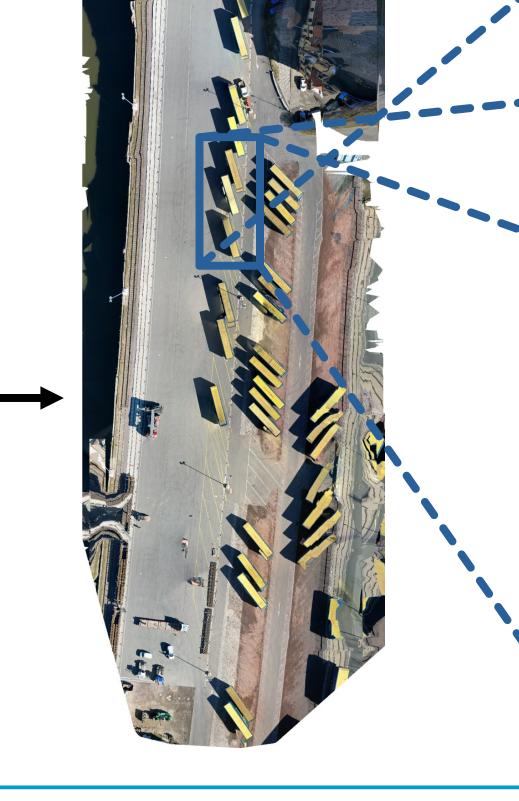
Orthophoto Generation

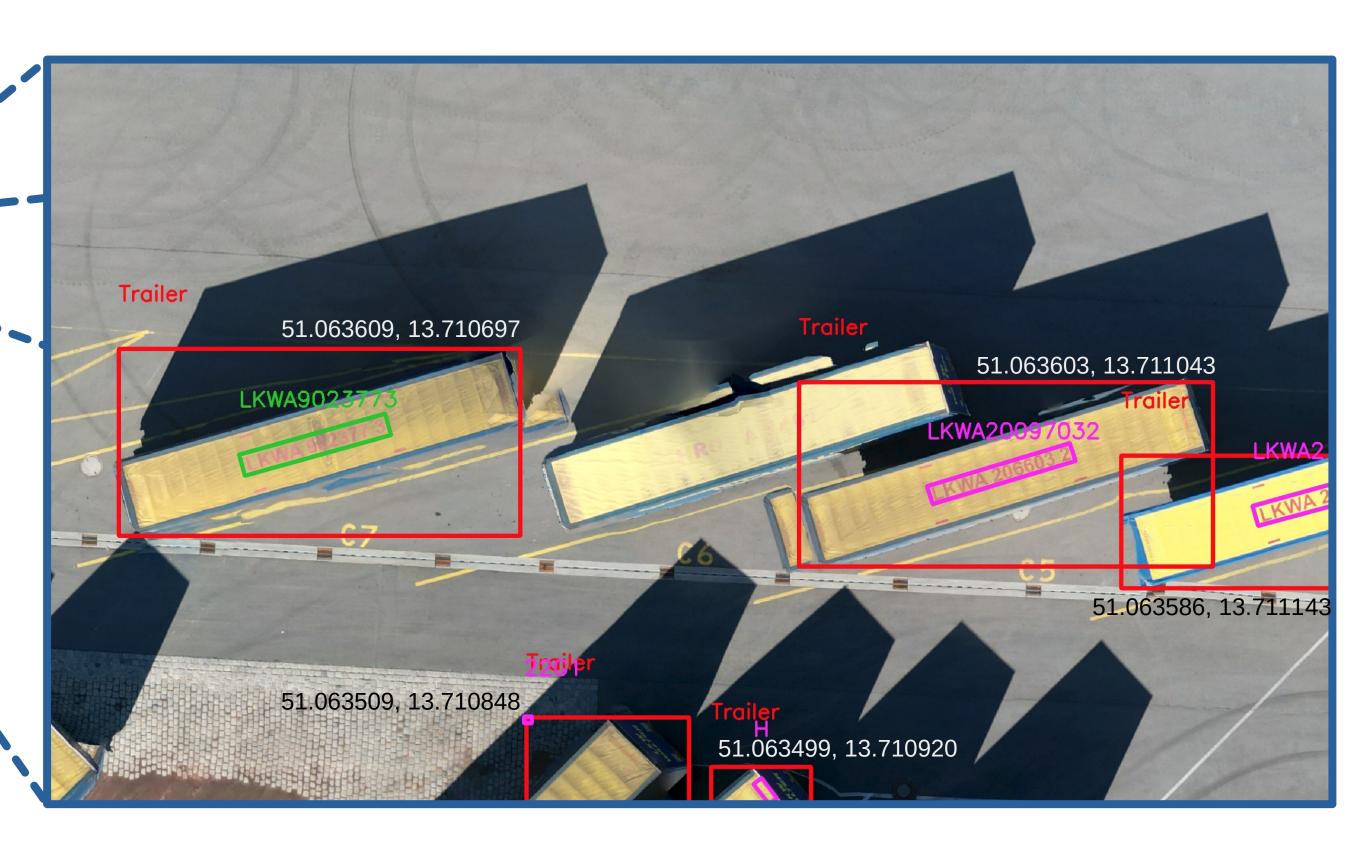












Results

- Results of a previous work [4]: • 0.50 F1-score for detection
- 0.16 CER for recognition
- Our results suggest robust detection and recognition also from UAV perspective

Stage	Model	Performance (metric)
TU Detection	YOLOv5s	0.71 (mAP@50)
Text Detection	DBNet++	0.87 (AR) 0.84 (AP) 0.85 (F1- Score)
Text Recognition	TrOCR	0.02 (CER)

Conclusion

- A system for identifying transportation units from both aerial and ground perspectives has been developed.
- Our system demonstrates robust performance across various operational conditions and provides a foundation for future development in port automation and optimisation.

References

Acknowledgments

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